



Heliophysics Explorers Program (HEP) 2019 Medium-Class Explorer (MIDEX) Announcement of Opportunity (AO) Pre-Proposal Conference

Overview of Science Evaluation

July 23, 2019

Dan Moses

NASA Science Mission Directorate

Heliophysics Division Explorers Program Scientist



Heliophysics Science Requirements



- All investigations proposed in response to this solicitation must support the goals and objectives of the Heliophysics Explorers Program, and must be implemented by Principal Investigator (PI) led investigation teams.
- The NASA strategic objective addressed by the Heliophysics Explorer Program is to understand the Sun and its interactions with Earth and the solar system, including space weather.
- The NASA Science Mission Directorate (SMD) Heliophysics Division (HPD) is addressing this strategic objective by conducting Heliophysics investigations designed to address the following science goals:
 - Explore the physical processes in the space environment from the Sun to the Earth and throughout the solar system
 - Advance our understanding of the connections that link the Sun, the Earth, planetary space environments, and the outer reaches of our solar system
 - Develop the knowledge and capability to detect and predict extreme conditions in space to protect life and society and to safeguard human and robotic explorers beyond Earth.



Requirements Deferred Until Step 2



- Science evaluation requirements deferred to Phase 2
 - Student Collaborations
 - Science Enhancement Options
 - SEO costs will not count against the PI-Managed Mission Cost but will instead be counted against the Enhanced PI-Managed Mission cost.
- Other requirements deferred to Phase 2
 - Space Systems Protection (costs outside PIMCC)
 - Detailed disposal plan,
 - Independent Verification and Validation of Software,
 - Conjunction assessment risk analysis,
 - Requirements for real-year dollars
 - Schedule-based end-to-end data management plan
 - Top level data management is still required!



Science Evaluation MDEX AO



Requirement 9: Proposals shall describe a science investigation with goals and objectives that address the program science goals described in Section 2.

Requirement 10: Proposals shall demonstrate how the proposed investigation will fully achieve the proposed objectives.

Requirement 11: Proposals shall clearly state the relationship between the science objectives, the data to be returned, and the instrument complement to be used in obtaining the required data (see Appendix B, Section D, for additional detail).



Science Evaluation MDEX AO



Requirement 12: Proposals shall include Data Plans to calibrate (both preflight and in-flight), analyze, publish, and archive the data returned, and shall demonstrate, analytically or otherwise, that sufficient resources have been allocated to carry out the Data Plans within the proposed mission cost. The Data Management and Archiving Plan shall include a discussion and justification of any data latency period (see Appendix B, Section E.4, for additional detail). The Data Management and Archive Plan shall be in compliance with the requirements and guidelines in the *NASA Plan for Increasing Access to the Results of Scientific Research* or a justification shall be provided that this is not necessary given the nature of the work proposed.

Requirement 13: Proposals shall state the specific science objectives and their required measurements at a level of detail sufficient to allow an assessment of the capability of the proposed mission to make those specific measurements and whether the resulting data will permit achievement of these objectives (see Appendix B, Sections D and E, for additional detail).



Science Evaluation MDEX AO



Requirement 14: Proposals shall describe the proposed instrumentation, including a discussion of each instrument and the rationale for its selection.

Requirement 15: Proposals shall specify only one Baseline Science Mission and only one Threshold Science Mission.

Requirement 16: Proposals shall not identify any descopes or other risk mitigation actions that result in the mission being unable to achieve the Threshold Science Mission objectives.

Requirement 19: Proposals submitted in response to this AO shall demonstrate that the proposed investigation is a complete and compelling science investigation requiring a spaceflight mission.



Technology Demonstration Opportunity



Proposals may contain less mature technologies and/or advanced engineering developments necessary to achieve the Baseline and Threshold Science Missions, which will be considered PI-Team-Developed Enabling Technology Demonstration Opportunities (TDOs).

	Relationship to Investigation Success	
	Enabling	Enhancing
PI-Team-Developed: No NASA guarantee that the technology will be at TRL 6 by mission PDR	<p>Panel evaluates technology as part of the baseline mission.</p> <p>Evaluation occurs in Steps 1 and 2.</p> <p>Backup plan required.</p>	<p>Panel evaluates merit and feasibility of technology independent of the baseline mission. Separability is also evaluated.</p> <p>Evaluation occurs in Step 2.</p> <p>Backup plan not required.</p> <p>≤\$5M Incentive</p>



Investigation Evaluation Criteria

- 2019 Heliophysics MDEX AO (NNH19ZDA013O):
 - A. **Scientific Merit of the Proposed Investigation (Section 7.2.2);**
 - B. **Scientific Implementation Merit and Feasibility of the Proposed Investigation (Section 7.2.3);**
 - C. TMC Feasibility of the Proposed Mission Implementation, including Cost Risk (Section 7.2.4).
- Weighting: the first criterion is weighted approximately 40%; the second and third criteria are weighted approximately 30% each.
- Evaluation Forms:
 - Form A for Criterion A
 - Form B for Criterion B
 - Form C for Criterion C
- Other Selection Factors (Section 7.3):
 - Programmatic factors
 - PI-Managed Mission Cost



Form A:

Scientific Merit Evaluation Factors

- The information provided in a proposal will be used to assess the intrinsic scientific merit of the proposed investigation.
- Scientific merit will be evaluated for the Baseline Science Mission and the Threshold Science Mission.
 - Science enhancement options beyond the Baseline Science Mission will not contribute to the assessment of the scientific merit of the proposed investigation.
- Four (4) separate scientific merit factors will be evaluated



Form A:

Scientific Merit Evaluation Factors

- **Factor A-1. Compelling nature and scientific priority of the proposed investigation's science goals and objectives.**
 - This factor includes the clarity of the goals and objectives; how well the goals and objectives reflect program, Agency, and National priorities; the potential scientific impact of the investigation on program, Agency, and National science objectives; and the potential for fundamental progress, as well as filling gaps in our knowledge relative to the current state of the art.
- **Factor A-2. Programmatic value of the proposed investigation.**
 - This factor includes the unique value of the investigation to make scientific progress in the context of other ongoing and planned missions; the relationship to the other elements of NASA's science programs; how well the investigation may synergistically support ongoing or planned missions by NASA and other agencies; and the necessity for a space mission to realize the goals and objectives.
- **Factor A-3. Likelihood of scientific success.**
 - This factor includes how well the anticipated measurements support the goals and objectives; the adequacy of the anticipated data to complete the investigation and meet the goals and objectives; and the appropriateness of the mission requirements for guiding development and ensuring scientific success.
- **Factor A-4. Scientific value of the Threshold Science Mission.**
 - This factor includes the scientific value of the Threshold Science Mission using the standards in the first factor of this section and whether that value is sufficient to justify the proposed cost of the mission.



Form B:



Scientific Implementation Merit & Feasibility

- The information provided in a proposal will be used to assess merit of the plan for completing the proposed investigation, including the scientific implementation merit, feasibility, resiliency, and probability of scientific success of the proposed investigation.
- Five (5) science implementation merit and feasibility factors are evaluated for each proposal.
- One additional science implementation merit and feasibility factor will be evaluated for those proposals including Science Enhancement Options (SEO).
 - The inclusion of SEO is not required for proposals to the H-MIDEX AO or the SALMON-2 PEA-Q.



Evaluation Factors B-1 to B-3: Scientific Implementation Merit & Feasibility

- **Factor B-1. Merit of the instruments and mission design for addressing the science goals and objectives.**
 - This factor includes the degree to which the proposed mission will address the goals and objectives; the appropriateness of the selected instruments and mission design for addressing the goals and objectives; the degree to which the proposed instruments and mission can provide the necessary data; and the sufficiency of the data gathered to complete the scientific investigation.
- **Factor B-2. Probability of technical success.**
 - This factor includes the maturity and technical readiness of the instruments or demonstration of a clear path to achieve necessary maturity; the adequacy of the plan to develop the instruments within the proposed cost and schedule; the robustness of those plans, including recognition of risks and mitigation plans for retiring those risks; the likelihood of success in developing any new technology that represents an untested advance in the state of the art; the ability of the development team - both institutions and individuals - to successfully implement those plans; and the likelihood of success for both the development and the operation of the instruments within the mission design.
- **Factor B-3. Merit of the data analysis, data availability, and data archiving plan.**
 - This factor includes the merit of plans for data analysis and data archiving to meet the goals and objectives of the investigation; to result in the publication of science discoveries in the professional literature; and to preserve data and analysis of value to the science community. Considerations in this factor include assessment of planning and budget adequacy and evidence of plans for well-documented, high-level data products and software usable to the entire science community; assessment of adequate resources for physical interpretation of data; reporting scientific results in the professional literature; and assessment of the proposed plan for the timely release of the data to the public domain for enlarging its science impact.



Evaluation Factors B-4 to B-6: Scientific Implementation Merit & Feasibility

- **Factor B-4. Science resiliency.**
 - This factor includes both developmental and operational resiliency. Developmental resiliency includes the approach to descoping the Baseline Science Mission to the Threshold Science Mission in the event that development problems force reductions in scope. Operational resiliency includes the ability to withstand adverse circumstances, the capability to degrade gracefully, and the potential to recover from anomalies in flight.
- **Factor B-5. Probability of science team success.**
 - This factor will be evaluated by assessing the experience, expertise, and organizational structure of the science team and the mission design in light of any proposed instruments. The role of each Co-Investigator and collaborator will be evaluated for necessary contributions to the proposed investigation; the inclusion of Co-Is and/or collaborators who do not have a well defined and appropriate role may be cause for downgrading during evaluation.



Science Evaluation Products: Findings



- **Major Strength:** A facet of the implementation response that is judged to be of superior merit and can substantially contribute to the ability of the project to meet its scientific objectives.
- **Major Weakness:** A deficiency or set of deficiencies taken together that are judged to substantially weaken the project's ability to meet its scientific objectives.
- **Minor Strength:** A strength that is worthy of note and can be brought to the attention of Proposers during debriefings, but is *not* a discriminator in the assessment of merit.
- **Minor Weakness:** A weakness that is sufficiently worrisome to note and can be brought to the attention of Proposers during debriefings, but is *not* a discriminator in the assessment of merit.



Form A and B Grade Definitions

- **Excellent:** A comprehensive, thorough, and compelling proposal of exceptional merit that fully responds to the objectives of the AO as documented by numerous and/or significant strengths and having no major weaknesses.
- **Very Good:** A fully competent proposal of very high merit that fully responds to the objectives of the AO, whose strengths fully outbalance any weaknesses.
- **Good:** A competent proposal that represents a credible response to the AO, having neither significant strengths nor weaknesses and/or whose strengths and weaknesses essentially balance.
- **Fair:** A proposal that provides a nominal response to the AO but whose weaknesses outweigh any perceived strengths.
- **Poor:** A seriously flawed proposal having one or more major weaknesses (e.g., an inadequate or flawed plan of research or lack of focus on the objectives of the AO).



Evaluation Clarifications



- NASA will request clarification of Potential Major Weaknesses (PMWs) identified by the evaluation panels in:

- 1. Science Merit**
- 2. Scientific Implementation Merit and Investigation**
- 3. TMC Feasibility of the Proposed Mission/Investigation Implementation**

- NASA will request such clarification uniformly, from all proposers.
- All requests for clarification from NASA, and the proposer's response, will be in writing.
- The ability of proposers to provide clarification to NASA is extremely limited, as NASA does not intend to enter into discussions with proposers.
- PIs whose proposals have no potential major weaknesses will receive an email informing them.
- The form of the clarifications is strictly limited to five types of responses:
 1. Identification of the locations in the proposal (page(s), section(s), line(s)) where the potential major weakness is addressed
 2. Noting that the potential major weakness is not addressed in the proposal.
 3. Stating that the potential major weakness is invalidated by information that is common knowledge and is therefore not included in the proposal.
 4. Stating that the analysis leading to the potential major weakness is incorrect and identifying a place in the proposal where data supporting a correct analysis may be found.
 5. Stating that a typographical error appears in the proposal and that the correct data is available elsewhere inside or outside of the proposal.

The PI will be given at least 24 hours to respond to the request for clarification. Any response that goes beyond a clarification will be deleted and will not be shown to the evaluation panel.



References



MIDEX Reference Material



2019 Heliophysics MIDEX Acquisition Page

The 2019 Heliophysics Explorer MIDEX acquisition home page is available at:

<http://explorers.larc.nasa.gov/HPMIDEX/>

The contents of the web site include the following:

- Links to MIDEX pages
- 2019 Heliophysics MIDEX major milestones
- Community announcements
- FBO
- Teaming interest
- Pre-proposal conference



MIDEX Reference Material



Program Library

It is incumbent upon the proposer to ensure that the documents used in proposal preparation are of the date and/or revision available in the Program Library (<https://explorers.larc.nasa.gov/HPMIDEX/programlibrary.html>).

A detailed Change Log has been implemented, and will continually document updates to the Program Library.



Questions?



**All further questions pertaining to the MIDEX AO
MUST
be addressed to:**

**Dr. Daniel Moses
Heliophysics Explorers Lead Program Scientist
Science Mission Directorate
NASA Headquarters
Washington, DC 20546
dan.moses@nasa.gov
(subject line to read “2019 Heliophysics MIDEX”)
202.358.0558**